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Chromosome numbers in some alien plant species of Novosibirsk Region: post III

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Keywords: adventive species, diploids, invasive species, Novosibirsk Region, polyploids, West Siberia.

Summary. This paper presents the chromosome numbers (2*n*) for 13 alien species (from the families Apocynaceae, Asteraceae, Brassicaceae, Fabaceae, Lamiaceae, Polygonaceae, Solanaceae) in the Novosibirsk Region. For *Vincetoxicum hirundinaria* Medik. (2*n* = 22) and *Sisymbrium altissimum* L. (2*n* = 14), chromosome numbers were determined for the first time on the material from Russia; for *Betonica officinalis* L. (2*n* = 16) – from Asian Russia; for *Stachys annua* (L.) L. (2*n* = 34) – from West Siberia. Chromosome numbers on the material from the Novosibirsk Region were revealed for the first time for *Cosmos bipinnatus* Cav. (2*n* = 24), *Inula helenium* L. (2*n* = 20), *Sonchus oleraceus* L. (2*n* = 18), *Medicago sativa* subsp. *varia* (Martyn) Arcang. (2*n* = 32), *Rumex obtusifolius* L. (2*n* = 20) and *Solanum nigrum* L. (2*n* = 48). For all the species studied, brief notes on their general distribution and dispersal in the Novosibirsk Region are provided, along with literature data on chromosome numbers from other regions of Russia.

Числа хромосом некоторых чужеземных видов растений Новосибирской области: сообщение III

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Ключевые слова: адвентивные виды, диплоиды, Западная Сибирь, инвазивные виды, Новосибирская область, полиплоиды.

Аннотация. Приводятся числа хромосом (2*n*) для 13 адвентивных видов из семейств Apocynaceae, Asteraceae, Brassicaceae, Fabaceae, Lamiaceae, Polygonaceae, Solanaceae на материале из Новосибирской области. Впервые для России приводится число хромосом для *Vincetoxicum hirundinaria* Medik. (2*n* = 22), *Sisymbrium altissimum* L. (2*n* = 14), для Азиатской части России – *Betonica officinalis* L. (2*n* = 16), для Западной Сибири – *Stachys annua* (L.) L. (2*n* = 34), для Новосибирской области – *Cosmos bipinnatus* Cav. (2*n* = 24), *Inula helenium* L. (2*n* = 20), *Sonchus oleraceus* L. (2*n* = 18), *Medicago sativa* subsp. *varia* (Martyn) Arcang. (2*n* = 32), *Rumex obtusifolius* L. (2*n* = 20), *Solanum nigrum* L. (2*n* = 48). Для всех исследованных видов приводятся краткие сведения по общему распространению и расселению в Новосибирской области, литературные данные по числам хромосом с территории России.

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We continue the karyological study of adventive species in the flora of the Novosibirsk Region (An'kova, Zykova, 2020, 2021; Zykova, Pankova, 2021). In this paper, we present the results for 13 species found in the Novosibirsk Region. Among them, *Cosmos bipinnatus*, *Matricaria discoidea*, *Sonchus oleraceus*, *Tripleurospermum inodorum*, *Solanum nigrum*, *Hyoscyamus niger* are widespread in the region; *Inula helenium*, *Medicago sativa* subsp. *varia* and *Rumex obtusifolius* were recently discovered and are actively expanding here; *Vincetoxicum hirundinaria*, *Sisymbrium altissimum*, *Betonica officinalis*, *Stachys annua* are rare species in the region.

Chromosome numbers were counted by direct observation in metaphase in root meristem squash preparations according to the method used by Zykova and Pankova (2021). Metaphase plates were observed under 100× magnification of the Axioscope 40 (Karl Zeiss, Axio Lab) microscope and photographed with an AxioCam MRc 5 digital camera.

For all species, literature references on chromosome numbers observed in material collected in Russia are given. Latin names of plants are provided according to the "Catalog of Life" (Hassler, 2020). Voucher specimens have been deposited to the Herbarium of the Central Siberian Botanical Garden SB RAS (NS, Novosibirsk).

APOCYNACEAE

Vincetoxicum hirundinaria Medik., **2*n* = 22**

"Novosibirsk Region, Novosibirsk District, Akademgorodok, mixed forest across the road from the old live collection plots of the Central Siberian Botanical Garden. 16 IX 2020. E. Zykova, 1320-Z858" (NS0045599).

Distribution: Europe. In the Novosibirsk Region, the species is known only from the Central Siberian Botanical Garden. The species has persisted for over 20 years in old live collection plots and has been spreading in the surrounding native forest, where it blooms profusely and bears fruit (Zykova et al., 2014; Zykova, 2019).

This is the first report of the chromosome number for this species in Russia. The same chromosome number was indicated from many European countries (Rice et al., 2015).

Diploid (2*x*), *x* = 11.

ASTERACEAE

Cosmos bipinnatus Cav., **2*n* = 24**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Geroev Truda Street, wasteland. 29 VIII 2019. E. Zykova, 1019-Z806" (NS0045573).

Distribution: North and Central American species cultivated in many regions of the world, including Siberia. In the Novosibirsk Region, it is one of the most popular ornamental annuals. As a weed, it was recorded in the city of Novosibirsk, as well as in some other districts of the region (Zykova, 2019).

This is the first record of the chromosome number for this species in the Novosibirsk Region. The same chromosome number was revealed in the Primorye Territory (Probatova, 2014, and references therein) and the Republic of Altai (Zykova, Pankova, 2021).

Diploid (2*x*), *x* = 12.

Inula helenium L., **2*n* = 20**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Central Siberian Botanical Garden, in old overgrown areas, 54°59'N, 83°00'E. 09 X 2017. E. Zykova, T. Shemetova, 7517-Z319" (NS0045598); "Novosibirsk Region, Iskitim District, right bank slope of the river Shipunikha opposite of the "67 km" railway station, steppe with *Stipa capillata*. 13 X 2019. O. E. Kosterin, N. V. Priydak, Z822".

Distribution: European-Mediterranean-West Asian species, found in some regions of Siberia.

The only find in the Novosibirsk Region was recorded in the Novosibirsk District, in the valley of the Inya River, near the railway station "Razyezd Inya" (Krasnoborov, 2000). Later, the species was mentioned in Akademgorodok and in the Moshkovo District (Zykova et al., 2014, 2017).

This is the first report of the chromosome number in this species for the Novosibirsk Region. The same chromosome number was determined in material from the Chechen Republic (Magulaev, 1974), the Republic of Altai (Rostovtseva, 1983; Zykova et al., 2021a), and the Primorye Territory (Probatova, 2014, and references therein).

Diploid (2*x*), *x* = 10.

Matricaria discoidea DC., **2*n* =18**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Voevodskogo Street, near fences, on lawns. 03 VII 2020. E. Zykova, 0720-Z850" (NS0045576).

Distribution: North American species that has spread across all continents. In Siberia, the species appeared in the end of the 19th century (Krylov, 1904). Currently common in all regions; included in the Black Book of Siberian Flora (Philipova,

Tarasova, 2016). In the Novosibirsk Region, this is one of the most common adventive species found in disturbed and artificially created habitats (Zykova, 2019).

The same chromosome number was mentioned for the Leningrad and Tomsk (Chisla khromosom …, 1990), Novosibirsk (Krasnikov, Lomonosova, 1990), Sakhalin (Probatova et al., 2007, and references therein) Regions, the Irkutsk Region and the Republic of Buryatia (Chepinoga, 2014, and references therein), the Khabarovsk Territory (Probatova, Sokolovskaya, 1990), Komi Republic (Lavrenko, Serditov, 1991), Kabardino-Balkarian Republic (Korobkov, Kotseruba, 2017), the Republic of Altai (Zykova et al., 2018), the Republic of Sakha (Yakutia) (Korobkov et al., 2019).

Diploid (2*x*), *x* = 9.

Sonchus oleraceus L., **2*n* = 18**

"Novosibirsk City, Central Siberian Botanical Garden, parterre. 54°49'16.45"N, 83°06'13.67"E. 22 X 2018. T. V. An'kova, Z648" (NS).

Distribution: common cosmopolitan weed. Included in the list of invasive and potentially invasive species of Siberia (Ebel et al., 2014). In the Novosibirsk Region, first was recorded in Berdsk (Krylov, 1904), currently registered in 10 districts of the region (Zykova, 2019).

The chromosome number is given for the first time from the Novosibirsk Region. The same number is determined for the Primorye Territory (Probatova, 2014, and references therein) and the Republic of Altai (An'kova, Zykova, 2017). Chromosome number 2*n* = 32 was revealed for Komi Republic (Lavrenko, Serditov, 1991), the Sakhalin (Probatova et al., 2007, and references therein) and Leningrad (Probatova et al., 2014) Regions, the Primorye Territory (Probatova, 2014, and references therein), the Republic of Altai (An'kova, Zykova, 2017). The number 2*n* = 36 was registered in collections from the Republic of Buryatia (Chepinoga, 2014, and references therein).

Diploid (2*x*), *x* = 9.

Tripleurospermum inodorum (L.) Sch.-Bip., **2*n* = 36**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, wasteland within the "Sigma" residential complex. 23 IX 2020. E. Zykova, 1820-Z851" (NS0045577).

Distribution: a ruderal plant found in almost all extratropical countries in both hemispheres. Included in the Black Book of Siberian Flora (Doronkin, Lamanova, 2016). Widely distributed in the Novosibirsk Region (Zykova, 2019).

Two chromosome complements in this species were revealed in material from Russia. The number 2*n* = 36 was mentioned for the Leningrad (Chisla khromosom…, 1990) and Novosibirsk (Krasnikov, Lomonosova, 1990) Regions, the Krasnoyarsk (Stepanov, 1994), Khabarovsk (Probatova et al., 2012) and Primorye (Probatova, 2014, and references therein) Territories, the Republic of Karelia (Probatova et al., 2009), the Irkutsk Region and the Trans-Baikal Territory (Chepinoga, 2014, and references therein), the Republic of Buryatia and the Sakhalin Region (Kotseruba et al., 2016), the Republic of Altai (Lomonosova et al., 2018), the Republic of Sakha (Yakutia) (Korobkov et al., 2019), the Altai Territory and the Kemerovo Region (Korobkov et al., 2020). The number 2*n* = 18 was registered in material from the Amur Region (Probatova et al., 2008), the Primorye Territory (Probatova, 2014, and references therein), the Kabardino-Balkarian Republic (Korobkov, Kotseruba, 2017), and the Astrakhan Region (Korobkov et al., 2019).

Tetraploid (4*x*), *x* = 9.

BRASSICACEAE

Sisymbrium altissimum L., **2*n* = 14**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Nikolaeva Street, wasteland, 54°85'83.75"N, 83°11'31.26"E. 07 IX 2018. E. Zykova, 3618-Z662" (NS0045600).

Distribution: Holarctic species, rare in Siberia. In the Novosibirsk Region, isolated finds were registered in the Bagan, Karasuk, Novosibirsk Districts and in the city of Novosibirsk (Zykova, 2019).

This is the first record of the chromosome number in this species for Russia. The same chromosome number was reported for collections from some European countries, North America (USA, Canada), Iran and Pakistan (Rice et al., 2015).

Diploid (2*x*), *x* = 7.

FABACEAE

Medicago sativa subsp. ***varia*** (Martyn) Arcang. (*M. varia* Martyn), **2*n* = 32**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Academicheskaya Street, wasteland. 12 IX 2017. E. Zykova, 7417-Z478" (NS0042546); "Novosibirsk Region, Novosibirsk city, Akademgorodok, Nikolaeva Street, by the roads. 01 VIII 2017. E. Zykova, 3917-Z504" (NS0042543).

Distribution: the range of the species spans across Eastern Europe and Kazakhstan. It is included in the

list of invasive and potentially invasive species of Siberia (Ebel et al., 2014). Actively spreading within the city of Novosibirsk and its suburbs (Zykova, 2019).

This is the first report of the chromosome number for the Novosibirsk Region. The same number was reported for the Irkutsk Region (Krivenko et al., 2015), the Khabarovsk Territory (Probatova et al., 2017) and the Republic of Altai (Zykova et al., 2021b).

Tetraploid (4*x*), *x* = 8.

LAMIACEAE

Betonica officinalis L.**, 2*n* = 16**

"Novosibirsk Region, Novosibirsk District, Akademgorodok, mixed forest across the road from the old live collection plots of the Central Siberian Botanical Garden. 16 IX 2020. E. Zykova, 1320-Z847" (NS0045575).

Distribution: Europe. Originally planted and grown in live collection plots of the Central Siberian Botanical Garden, where it has persisted for over 20 years and expanded into the surrounding mixed forest (Zykova et al., 2014; Zykova, 2019).

This is the first report of the chromosome number for Asian Russia. The same chromosome number was revealed in collections for the Stavropol Territory (Chisla khromosom …, 1990).

Diploid (2*x*), *x* = 8.

Stachys annua (L.) L., **2*n* = 34**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Kirova village, wasteland, 54°59'N, 83°00'E. 19 IX 2017. E. Zykova, T. Shemetova, 7417-Z407" (NS0045597).

Distribution: Europe, Mediterranean, Asia Minor, spreading across the Holarctic. Very rare in the Novosibirsk Region, with isolated records from the Kuybyshev, Kolyvan and Ordynskoe Districts and the city of Novosibirsk (Zykova, 2019).

This is the first report of the chromosome number for West Siberia. The same number was revealed in collections from the Irkutsk Region (Chepinoga, 2014, and references therein).

Diploid (2*x*), *x* = 17.

POLYGONACEAE

Rumex obtusifolius L., **2*n* = 20**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Berdskiy tupik Street. 15 X 2020. D. N. Shaulo, Z884" (NS).

Distribution: European species actively spreading in South Siberia.

Recently entered to the Novosibirsk Region (Ebel et al., 2016). Actively spreading in the forest-park zone of Akademgorodok, as well as along roads and in urban residential areas (Zykova, 2019). Recorded on a meadow edge in birch forest in the Novosibirsk District of the region (Seregin, 2020).

This is the first report of the chromosome number for the Novosibirsk Region. The same number was revealed in collections from the Krasnodar Territory (Probatova et al., 2009) and the Republic of Altai (Zykova et al., 2021b). Tetraploid (2*n* = 40) was revealed in collections from the Sakhalin Region (Probatova et al., 2007, and references therein). Two different chromosome numbers for this species (2*n* = 24 and 2*n* = 36) are indicated from the Krasnoyarsk Territory (Stepanov, Muratova, 1995).

Diploid (2*x*), *x* = 10.

SOLANACEAE

Hyoscyamus niger L., **2*n* = 34**

"Novosibirsk Region, Novosibirsk City, Akademgorodok, Tereshkovoy Street, near buildings, around lawns and flower beds, by the roads, 54°59'N, 83°00'E. 01 VIII 2017. E. Zykova, 3817-Z382" (NS0045596).

Distribution: Eurasian species with a cosmopolitan secondary range. A fairly common weed in the Novosibirsk Region, found in residential areas, in crops, along roads (Zykova, 2019).

The same number was determined for the Novosibirsk Region (Krasnikov, 1991), the Republic of Tuva, Kabardino-Balkarian and Chechen Republics (Chisla khromosom …, 1993), the Republic of Altai (Krivenko et al., 2013), the Trans-Baikal (Chepinoga, 2014, and references therein) and Primorye (Probatova, 2014, and references therein) Territories.

Diploid (2*x*), *x* = 17.

Solanum nigrum L., **2*n* = 48**

"Novosibirsk Region, Berdsk City, Pervomayskaya Street, wasteland opposite of the city market. 23 X 2018. D. N. Shaulo, Z704" (NS).

Distribution: Holarctic species, widely settled in Siberia. Observations in the Novosibirsk Region date back the beginning of the 20th century (Krylov, 1907). Nowadays the species is a common weed in all parts of the region (Zykova, 2019).

This is the first report of the chromosome number for the Novosibirsk Region. The same number was revealed in collections from the Republic of Altai (Zykova et al., 2021a). Previously, 2*n* = 60 was indicated in the Stavropol Territory and Chechen

Republic (Magulaev, 1984); 2*n* = 72 – in Moscow, Sverdlovsk (Gerasimenko, Reznikova, 1968) and Irkutsk (Probatova et al., 2015) Regions and in the Primorye Territory (Probatova, 2014, and references therein).

Tetraploid (4*x*), *x* = 12.

Conclusion

The study provides the first records of chromosome numbers for 13 alien species based on the material from the Novosibirsk Region. We treat species with basic chromosome numbers x = 7, 8, 9, 10, 11, 12, 17 as diploids. Thus, the majority of the studied species are diploids. Three species are tetraploids: *Medicago sativa* subsp. *varia*, *Solanum nigrum* and *Tripleurospermum inodorum*. Our data agree with previously published information on the chromosome numbers of populations of East Siberia, the Far East, and European Russia.

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